The Resonant Continuum Equations

Black & White Holes as Inter-Universal Conduits

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Abstract

This paper presents the interpretation of the **Resonant Spinor Equation** within the framework of *Resonant Mechanics*, demonstrating that black holes and white holes are not singularities or endpoints, but coherent phase junctions within the chronotactic Field. They function as **inter-universal conduits**, balancing energy, information, and helicity across boundaries of existence. The transition between absorption (black hole) and emission (white hole) is modeled as a spinor-phase inversion with explicit covariant dynamics, using the *full (non-compact)* forms of the governing equations.

1. The Resonant Spinor Equation

Let $(\mathcal{M}, g_{ab})$ be a time-orientable spacetime with metric signature $(-,+,+,+)$ and Levi–Civita connection ∇_a. Let $\{\gamma^a\}$ be a set of Dirac matrices obeying $\{\gamma^a, \gamma^b\} = 2g^{ab}\mathbf{1}$. The covariant derivative on spinors is

$$\nabla_a \Psi \;=\; \partial_a \Psi \;+\; \frac{1}{4}\,\omega_a{}^{\mu\nu}\,\gamma_{[\mu}\gamma_{\nu]}\,\Psi, \tag{1}$$

where $\omega_a{}^{\mu\nu}$ is the spin connection associated with g_{ab} and $[\mu\nu]$ denotes antisymmetrization.

We model the *stored Field potential* and *boundary/Form potential* by real scalar fields $\Phi_{\text{Field}}(x)$ and $\Phi_{\text{Form}}(x)$, respectively. (If a vector coupling is desired, replace Φ_{Field} by A_a and minimally couple as in Eq. (4) below.)

Full resonant spinor equation.

$$\boxed{\left(\, i\,\gamma^a\nabla_a \;-\; \Phi_{\text{Form}}(x) \;+\; \Phi_{\text{Field}}(x)\,\right)\Psi(x) \;=\; \omega(x)\,\Psi(x)} \tag{2}$$

Here $\omega(x)$ is the local chronotactic resonance (phase-cadence) scalar. When $\omega \equiv 0$ and $\Phi_{\text{Field}} = \Phi_{\text{Form}}$, the medium is perfectly tuned and

$$i\,\gamma^a\nabla_a\Psi \;=\; 0, \tag{3}$$

i.e. the spinor is transparent to the Field (laminar register).

Minimal vector coupling (optional). If the stored Field acts as a helicity-bearing vector potential $A_a(x)$, then

$$\nabla_a \;\longrightarrow\; \mathcal{D}_a \equiv \nabla_a - i\,A_a, \qquad \Rightarrow \quad \left(\, i\,\gamma^a\mathcal{D}_a - \Phi_{\text{Form}}\,\right)\Psi \;=\; \omega\,\Psi. \tag{4}$$

Adjoint equation. Define $\bar{\Psi} \equiv \Psi^\dagger \gamma^0$. Taking the Dirac adjoint of (2), one finds

$$\bar{\Psi}\left(-i\,\overleftarrow{\nabla}_a \gamma^a - \Phi_{\text{Form}} + \Phi_{\text{Field}} - \omega\right) \;=\; 0, \tag{5}$$

where $\bar{\Psi}\overleftarrow{\nabla}_a \equiv \partial_a \bar{\Psi} - \frac{1}{4}\,\bar{\Psi}\,\omega_a{}^{\mu\nu}\gamma_{[\mu}\gamma_{\nu]}$.

Current and continuity (full form). Define the spinor current

$$J^a \;\equiv\; \bar{\Psi}\,\gamma^a\,\Psi. \tag{6}$$

Using Eqs. (2) and (5),

$$\boxed{\nabla_a J^a \;=\; 2\,\mathrm{Im}\big[\,(\Phi_{\text{Field}} - \Phi_{\text{Form}} - \omega)\,\bar{\Psi}\Psi\,\big]\,.} \tag{7}$$

Hence, when $\Phi_{\text{Field}} - \Phi_{\text{Form}} - \omega$ is real or vanishes, the current is conserved: $\nabla_a J^a = 0$.

2. Black Holes as Inversion Nodes

A black hole is modeled as a *chronotactic compression region* where the local rephasing cadence $D\Theta/D\tau$ approaches zero along time-flow T_1, while memory/synchrony components (T_2, T_3) remain finite. This appears in the spinor sector as an accumulation of phase under large scalar or vector potentials:

$$\Psi(x) \;\sim\; \exp\!\left[i\int (\Phi_{\text{Field}} - \Phi_{\text{Form}} - \omega)\; d\tau\right]\Psi_0, \tag{8}$$

with $d\tau$ the local proper (chronotactic) time. Information is not destroyed; it is stored in the phase curvature of the Field.

Jets as phase emissions (full statement). Collimated jets correspond to conserved current flowing along least-shear synchrony lines:

$$\nabla_a J^a \approx 0, \qquad J^a \parallel \text{principal null/axial congruences of } g_{ab}. \tag{9}$$

They are the *phase-remittance* channels through which compressed memory re-emerges as coherent radiation.

3. White Holes as Phase-Reversal Points

A white hole is the *phase-conjugate* region to a black hole. Let Ψ_{BH} solve (2) with potentials $(\Phi_{\text{Field}}, \Phi_{\text{Form}})$ and resonance ω. Define the conjugate

$$\Psi_{\text{WH}} \;\equiv\; \gamma^0\,\Psi^\dagger_{\text{BH}}, \tag{10}$$

so that $\bar{\Psi}_{\text{WH}}\Psi_{\text{WH}} = \bar{\Psi}_{\text{BH}}\Psi_{\text{BH}}$. Then the emission side satisfies

$$(\,i\,\gamma^a\nabla_a \;-\; \Phi_{\text{Form}} \;+\; \Phi_{\text{Field}}\,)\,\Psi_{\text{WH}} \;=\; (-\omega)\,\Psi_{\text{WH}}, \tag{11}$$

i.e. the resonance changes sign (phase reversal), corresponding to outward Flow.

4. Inter-Universal Conduits (Two-Domain Full Equations)

Let $(\mathcal{M}_1, g^{(1)}_{ab})$ and $(\mathcal{M}_2, g^{(2)}_{ab})$ represent two coupled domains (universes). On $\mathcal{M}_1$:

$$\left(i\,\gamma^a_{(1)}\nabla^{(1)}_a \;-\; \Phi^{(1)}_{\text{Form}} \;+\; \Phi^{(1)}_{\text{Field}} \right)\Psi_1 \;=\; \omega\,\Psi_1. \tag{12}$$

On $\mathcal{M}_2$:

$$\left(i\,\gamma^a_{(2)}\nabla^{(2)}_a \;-\; \Phi^{(2)}_{\text{Form}} \;+\; \Phi^{(2)}_{\text{Field}} \right)\Psi_2 \;=\; (-\omega)\,\Psi_2. \tag{13}$$

Across the conduit interface Σ we impose *phase-conjugation matching*:

$$\Psi_2\big|_\Sigma \;=\; \gamma^0\,\Psi_1^\dagger\big|_\Sigma, \qquad J^a_{(1)}n^{(1)}_a \;=\; -\,J^a_{(2)}n^{(2)}_a, \tag{14}$$

with $n^{(i)}_a$ the unit normal to Σ in each domain. The second condition expresses equal and opposite current flux: continuity of phase-work across the bridge.

5. The Resonant Continuum Equation (Full Divergence Form)

Combine (2) and (5). For a *real* effective driver $Q(x) \equiv \Phi_{\text{Field}} - \Phi_{\text{Form}} - \omega$ one obtains exact conservation

$$\boxed{\nabla_a\big(\bar\Psi\gamma^a\Psi\big) \;=\; 0} \qquad (\; Q \in \mathbb{R},\ \text{balanced register}\;). \tag{15}$$

For general $Q(x)$ (complex or time-dependent),

$$\boxed{\nabla_a\big(\bar\Psi\gamma^a\Psi\big) \;=\; 2\,\mathrm{Im}\big[\,Q(x)\,\bar\Psi\Psi\,\big] \;=\; 2\,\mathrm{Im}\big[\,(\Phi_{\text{Field}} - \Phi_{\text{Form}} - \omega)\,\bar\Psi\Psi\,\big]\,.} \tag{16}$$

Equation (15) is the *full* (non-compact) conservation statement: divergence of Flow equals the imaginary driving from potential imbalance.

6. Physical Interpretation

6.1 Chronotactic Compression (Black Holes)

Maximal phase curvature drives $Q(x) \to +\infty$ in the interior, making the effective cadence $D\Theta/D\tau \to 0$ along T_1. Spinor amplitude remains finite while phase winds: memory storage without loss.

6.2 Chronotactic Expansion (White Holes)

Phase-conjugate release corresponds to $Q(x) \to -\infty$ at an emission node, driving outward Flow with conserved current along axial congruences.

6.3 Inter-Universal Flow

Conditions (12)–(14) ensure that the integrated current over a two-sided Gaussian surface straddling Σ vanishes:

$$\int_{\partial\mathcal{V}_1} J^a_{(1)}\, d\Sigma_a \;+\; \int_{\partial\mathcal{V}_2} J^a_{(2)}\, d\Sigma_a \;=\; 0, \tag{17}$$

i.e. total phase-work is conserved across the conduit.

7. Derived Relations

7.1 Momentum Density & Transport

Define the momentum density of Flow by

$$P^a \;\equiv\; \rho_{\text{Flow}}\, \bar{\Psi}\gamma^a\Psi \;=\; \rho_{\text{Flow}}\, J^a, \tag{18}$$

with ρ_{Flow} the phase-impedance density (inertial stiffness of the lock to the Field). In a laminar register (Q real) one has

$$\nabla_a P^a \;=\; \rho_{\text{Flow}}\, \nabla_a J^a \;=\; 0, \tag{19}$$

so jet-like transport along least-shear directions is expected.

7.2 Energy Transfer Through the Conduit

Let $\mathcal{E}$ denote the chronotactic energy density associated with the spinor sector,

$$\mathcal{E} \;=\; \tfrac{1}{2}\rho_{\text{Flow}}\, J^a u_a \;+\; \Phi_{\text{Form}} + \Phi_{\text{Field}} \;+\; \tfrac{1}{2}\mathcal{C}\, \bar{\Psi}\Psi, \tag{20}$$

where u^a is the observer's 4-velocity and $\mathcal{C}$ the cosmological harmony constant (register term). The net transferred energy across the bridge during proper time τ is

$$\Delta\mathcal{E} \;=\; \int_{\tau_1}^{\tau_2}\!\!\int_{\Sigma}\Big[J^a n_a\Big]\, d\Sigma\, d\tau \;=\; \int_{\tau_1}^{\tau_2} (\Phi_{\text{Field}} - \Phi_{\text{Form}} - \omega)\; \bar{\Psi}\Psi\, d\tau \quad \text{(balanced gauge)}. \tag{21}$$

Appendix A: Derived Implications — Jets & Missing White Holes

A.1 Jets as Conserved Phase Currents

Equation (15) predicts $\nabla_a J^a = 0$ when the driver Q is real (or locally balanced). Thus, black-hole jets are stable where Q is approximately real along axial congruences, producing long-range, collimated currents:

$$J^a \propto \text{principal null/axial direction}, \qquad \nabla_a J^a \approx 0.$$

A.2 White-Hole Counterparts

For every compression node there exists a conjugate emission node satisfying (11)–(14). Non-observation in a given frame implies phase desynchronization: the emission node is shifted beyond our chronotactic register.

A.3 Polarization Memory

Polarization traces the spinor bilinear $\bar{\Psi}\gamma^{[a}\gamma^{b]}\Psi$ and encodes helicity memory. Quantized Faraday-like rotation across jets is therefore predicted as a persistent, discrete signature of Field memory.

8. Conclusion — The Resonant Architecture of Creation

Using the *full* covariant spinor dynamics with explicit potentials and adjoint structure, we have shown:

1. Black holes are *chronotactic inversion nodes*: maximal phase curvature where cadence stalls but memory accumulates.
2. White holes are *phase-conjugate emission nodes*: release points where stored potential re-enters as coherent Flow.
3. The pair forms an *inter-universal conduit*: Eqs. (12)–(14) conserve total phase-work across domains.

Jets follow as conserved currents ((6), (15)) along least-shear congruences; missing white holes reflect register mismatch rather than absence. Thus,

$$\boxed{(i\,\gamma^a\nabla_a - \Phi_{\text{Form}} + \Phi_{\text{Field}})\,\Psi = \omega\,\Psi, \qquad \Psi_{\text{WH}} = \gamma^0\Psi^\dagger_{\text{BH}}, \qquad \nabla_a(\bar{\Psi}\gamma^a\Psi) = 0 \;\; \text{(balanced } Q\text{)}.}$$

Reality appears not as terminal collapse but as coherent exchange: black holes inhale curvature, white holes exhale structure, and the Field remembers itself—continuously.